



Newsletter

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Director's Note

The Institute of Ecosystem Studies recently broadened its program in graduate education by sponsoring a course in Fundamentals of Ecosystem Ecology.

The need for such a course was highlighted last year when IES graduate students pointed out that it was difficult to find university courses in ecosystem ecology. The Institute, with its staff of scientists experienced in the study of ecosystems, decided to help solve this problem.

The solution: a two-week intensive course. Our front-page story describes this course.

The IES Newsletter is published by the Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum. Located in Millbrook, New York, the Institute is a division of The New York Botanical Garden. All newsletter correspondence should be addressed to the Editor.

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Ecosystem Course for Ecology Students



Four of the students in the Institute's Fundamentals of Ecosystem Ecology course, and course coordinator Dr. David Strayer.

Institute of Ecosystem Studies graduate students¹ brought a problem to their advisors' attention: they felt that it was difficult to get basic training in ecosystem ecology. Many of their courses focused on organisms rather than on ecosystems. The students wanted to understand more about the interrelationships between living and non-living components of a natural community.

IES scientists, a number of whom hold university appointments and are graduate student advisors, felt that the Institute could provide a service to students in the form of a course in ecosystem ecology. Such a course would be good not only for the students, but also for the field of ecosystem ecology itself — the better prepared students were, the more likely that they would make future significant contributions to ecological research and education.

The scientists therefore decided to offer a two-week intensive course over the January intersession period. Of the students responding to the fall 1988 advertisement, 10 graduate students and 2 advanced undergraduates were accepted into the program. Universities represented were Fordham University, Middlebury College, Rutgers University, the State University of New York at Purchase, the University of Connecticut, and Yale University.

There were two principal themes considered during the course: the food web (the network of interconnected food chains within a community), and nutrient

cycling (the odyssey of the raw materials needed for life as these materials move from the environment, to the organism, to the environment). Landscape ecology and processes of ecosystem disturbance and recovery were also covered. Daily, in two two-hour sessions, the students met in the conference room at the Institute's Plant Science Building for lectures and discussions of assigned readings. These readings consisted primarily of book chapters and scientific journal articles selected by the instructors. A final examination concluded the course.

"Fundamentals of Ecosystem Ecology" was coordinated by Dr. David Strayer, who was assisted by Drs. Jonathan Cole, Gary Lovett and Michael Pace. Guest lecturers were IES Director Dr. Gene E. Likens as well as Drs. Charles Canham, Mark McDonnell and Steward Pickett.

Students will be sending Dr. Strayer evaluations of the course, and the future of this program depends in part on the marks the course receives. Dr. Strayer suspects, however, that the Institute would have no difficulty filling the course again, and that there is even a possibility of offering an advanced course in the future.

1. In collaboration with a number of universities such as Cornell, Rutgers and Yale, IES scientists serve as advisors for numerous graduate students. These graduate students do course work at the universities and do thesis research at the Institute.

The IES Greenhouse: Tropics in the Temperate Zone

At this time of year it becomes a tropical retreat ... an island of bright green in the subdued colors of winter ... a place where Arboretum visitors can enjoy outdoor things indoors, and learn something about current IES research programs at the same time ...

The greenhouse, the first building constructed at the Mary Flagler Cary Arboretum, was completed in 1972 to propagate seeds and cuttings for the Arboretum collection and to be a site for botanical research. David Bulkeley — greenhouse manager since 1982 — was hired as greenhouse gardener in early 1976, and in December of that year the first seeds for an attractive visitor display were planted: a waterfall at the north end of Unit 5 was built and plants moved around it for decoration.

At that time the only tropical plants grew on a small bench that was assigned to Mr. Bulkeley on his arrival — bird's nest ferns, a few *Scheuchzeria*, but little else. As time allowed and new plants arrived from The New York Botanical Garden, Longwood Gardens and various greenhouses, the collection grew out from the fountain. The tropical collection reached the south wall of Unit 5 within three years. The other units remained open for research, for growing seeds collected abroad, and for propagating Arboretum plants.

The greenhouse has two ranges, each leading from a central section of workrooms and offices. The public is invited to explore and enjoy the units within each range. As visitors arrive, they are greeted by a photographic display highlighting current scientific research at the Institute of Ecosystem Studies. Depending on immediate needs, the four small greenhouse units in the range to the west are used for controlled research by IES scientists as well as for plant rearing. Descriptions of the research projects, which have included testing the effects of air pollution on plants and growing seeds from soil samples collected from The New York Botanical Garden Forest in the Bronx, are posted by each experiment.

The range on the east side has three sections, including the tropical Unit 5. Unit 6, kept slightly cooler, is set aside for research by Institute ecologists. Visitors will notice a large plastic chamber, kept for experiments in which plants are exposed to air pollutants such as ozone, and a curious-looking piece of machinery used to wash plant roots when accurate weight measurements need to be made. When all available space isn't used for research plants, plants for display and propagation take up temporary residence.

Unit 7, still cooler, is set aside for large operations. Each year at this time the New York Horticultural Society relies on Mr.

Bulkeley to care for trees in such a way that they will be at their best during the New York Flower Show. This year, crabapple trees, their roots in burlap, were delivered early in January. Temperature and moisture conditions in the unit are being adjusted constantly so that by the time a heated van comes for the trees a few days before the show, they will be from 1 to 10% in flower. By the show's opening in early March, blossoming will be at its peak. This unit is also used for scientific experiments: several years ago, for example, maple trees were grown here to measure shade tolerances.

There are over 1000 types of plants in the greenhouse collection, with more than 2000 specimens in all. (An inventory of all greenhouse holdings was just completed, and a copy will be available to visitors for reference.) Interesting and unusual examples of plants are everywhere. The ponderosa lemon, *Citrus ponderosa*, developed in the United States in the 1800s, produces grapefruit-sized lemons. Two species of banana plant grow in a corner of the tropical unit (bananas flower and fruit only once, while a new plant sprouts from the parent; the next bunch of greenhouse bananas is expected sometime during 1990). In the center of the unit is *Ficus retusa nitida*. This tree arrived at the greenhouse in 1976 — no one else wanted it because it was tall, skinny and generally unattractive. Mr. Bulkeley transplanted it, gave it the attention it deserved ... and now climbs and prunes it two or three

times a year to keep it within the confines of the glass roof. Visitors will notice air roots extending from its branches, and should keep in mind that in nature the *Ficus* canopy can cover 0.1 hectare (one-quarter acre). Currently, hibiscus flowers and the bird-of-paradise are blooming. One of the world's most ancient plants, the cycad, is putting out a new set of leaves.

Plant collections include orchids, flowering in February and March; begonias (primarily donated by Mrs. Lee Kolker), flowering in February; *Hoya* species; and staghorn ferns, epiphytes that use their roots only for anchoring, and receive nutrients by funneling water down their leaves. The cactus collection, at the south end of the tropical unit, includes many unusual varieties, for example "living stones," *Lithops*, from South Africa.

The IES greenhouse ... the focus of the Arboretum's winter displays, but a place to be remembered at other times of the year as well ...

The greenhouse is open year-round, except public holidays. After picking up a free access permit at the Gifford House Visitor and Education Center, see the tropical collection, research plantings and other displays from 9 am to 4 pm Monday through Saturday, and 1 pm to 4 pm on Sunday. Groups should call in advance. Artists and photographers are welcome.



David Bulkeley tends to *Columnea* ("Bonfire"), a plant from Colombia. He is assisted in the greenhouse by Wendy Dembo, greenhouse gardener, and on weekends, holidays and during the summer by Tom Lounsbury, a student at Millbrook High School. In addition, he welcomes the help of active volunteers Edith Bancroft, Lisa Bandazian, Sherry Berman, Barbara Coggeshall, Diane Eaton, Faith Lathbury, Ruth Melton and Kevin Tompkins.

Manager of Laboratory Facilities



GLEN CLOYD

KATHLEEN C. WEATHERS is the new manager of laboratory facilities at the Institute. The IES laboratory is a state-of-the-art facility, where all samples from the Hubbard Brook Ecosystem Study are analyzed and where Institute ecologists bring their research samples to be processed. Ms. Weathers' responsibilities include overseeing all IES laboratory and computer equipment and facilities, setting up analytical methods and laboratory procedures, and overseeing chemical analysis of the samples collected for numerous research projects.

Ms. Weathers earned a master's degree in forest science at Yale University's School of Forestry and Environmental Studies. While at Yale she spent two summers at Mount Washington, N.H. collecting cloud

water for chemical analysis and studying alpine ecology. The data she collected in this pilot study gave rise to the Cloud Water Project, the first nationwide study of cloud water chemistry. Co-investigators Dr. Gene E. Likens and Yale's Dr. F. Herbert Bormann hired her to run the project, at IES, from February 1984 to September 1986. The study showed that cloud water is more acidic than rain from the same location, and that polluted cloud water has significant potential to cause damage to forests and agricultural areas in some parts of the United States.

In 1987, Ms. Weathers enrolled in a doctoral program in ecology at Rutgers University, with IES Director Dr. Likens as her major professor. During this time she began a research project to study cloud water deposition in the Catskill Mountains. High elevation forests are frequently exposed to whatever toxic chemicals may be present in those clouds. The Catskill Mountain ecosystem is of interest as an experimental site because of its proximity to a major urban corridor and

thus to potentially higher concentrations of airborne pollutants, and because it is part of the watershed that feeds reservoirs supplying water to New York City. Ms. Weathers chose as a field site a red spruce stand near the summit of Hunter Mountain, and is collecting samples both in the forest and at the forest edge in order to learn how deposition rates vary with respect to vegetation and topographical features. Her hypothesis is that the forest edge will receive greater deposition than the deep forest. Since forest gaps, created by fallen trees for example, act like an edge, she expects these to form pockets of high pollutant deposition within forests. This research, in which she works closely with IES plant ecologist Dr. Gary Lovett, has been supported by funds from the National Audubon Society and from the Andrew W. Mellon Foundation.

In addition to fulfilling her many responsibilities as laboratory manager, Ms. Weathers plans to continue her research on the chemical composition and deposition of cloud water.

Promotion



GLEN CLOYD

JUDITH L. LANE has been promoted to research assistant III. Ms. Lane has a master's degree in ecology from the University of California at Davis. Since May 1986 she has been working at IES with aquatic ecologist Dr. Jonathan Cole on his research into the role of the trace metal molybdenum in nitrogen cycles in aquatic ecosystems. Recently she has been doing some of her work at the Marine Ecosystem Studies Research Laboratory at the University of Rhode Island, where outdoor seawater tanks permit her to study factors limiting production in Narragansett Bay.

Each year The New York Botanical Garden honors staff members at an Award and Recognition Ceremony held in the Bronx. At the December 22nd, 1988 ceremony, three from the Institute of Ecosystem Studies received Special Recognition Awards: Carol W. Boice, custodian; Michael J. Fargione, research assistant II, who has been doing studies of canine predation on sheep; and Barbara J. McPeck, confidential secretary and receptionist.

In addition, the following IES employees received recognition for their years of service ... 10-14 years: Henry J. Behrens, Stephen A. Bialousz, David W. Bulkeley, Marvin C.

Chadwell, Janice B. Claiborne, Marcia T. Davis, Phyllis M. Haight, Allan E. Kling, Jay B. McAninch, William R. Newkirk, Roger T. Powell, Owen W. Vose, Raymond J. Winchcombe ... 15-19 years: James W. Boice, Ralph L. Elliott, Bonnie E. Fiero, John W. Olson, Bradley H. Roeller. Only three employees of The New York Botanical Garden were honored in the 35-39 year category. One of them was Richard A. Livellara, IES supervising maintainer, who joined The New York Botanical Garden staff as a laborer in January 1953 and moved north to work at the Arboretum in November 1972.



GLEN CLOYD

Left to right: Dick Livellara, Barbara McPeck, Mike Fargione and Carol Boice, are congratulated for their awards by Institute Administrator Joseph S. Warner.

Local Weather

Data collected at the IES Weather Station provide background information for ecological research at the Institute and serve as a standard against which long-term trends in weather and air quality may be compared.

November and December, 1988

Highest temperature: 19.1°C (66.4°F)
on November 5th

Lowest temperature: -20.3°C (-4.5°F)
on December 12th

Daily average temperature: 1.6°C
(34.9°F)
[Normal*: 1.1°C (34°F)]

Precipitation: 19.59 cm (7.7 in.)
[Normal: 17.63 cm (6.9)]

Average rainfall pH**: 4.51

Strongest wind gust: 66 km/hr (41
m.p.h.) from the west-northwest (285°)
on November 21st

Prevailing wind direction: West-
southwest (252°)

Average wind speed: 9 km/hr (5.6 m.p.h.)

**"Normal" values are taken from data collected for a 30-year period at the Millbrook School*

***Degrees of acidity or alkalinity are indicated using a logarithmic pH scale. On the scale of 0-14, vinegar — an acid — has a pH of approximately 3, and "neutral" is 7.0. The pH of "normal" rain is 5.6 or higher.*

Spring Calendar

CONTINUING EDUCATION PROGRAM

Catalogues describing IES landscape design, gardening and botany courses, as well as the following workshops and ecological excursions, are available at the Gifford House.

Workshops

- Mar. 22 Aerial Photography Workshops:
and 23 Airphoto Interpretation & Land Use
Remote Sensing with Color and Color-
Infrared Aerial Photography
Remote Sensing for Assessing Landfills
Apr. 29 Ecological Design and Landscape
Restoration

Ecological Excursions

- May 9 Ethnobotany and American Indian
Heritage
May 13 Ecology and Earth History: the Taconic,
Housatonic and Berkshire Highlands
May 19,20 Spirit of Northern Waters

SUNDAY ECOLOGY PROGRAMS

Free public programs are offered on the first and third Sunday of each month, except over holiday weekends. All programs are from one to two hours long, and begin at 2:00 p.m. at the Gifford House on Route 44A unless otherwise noted.

Tentative schedule (please call (914) 677-5358 to confirm the day's topic):

- Apr. 2 On Safari in Kenya (Jill Cadwallader) —
Talk
Apr. 16 Reading the Rocks (Dr. Alan Berkowitz)
— Walk
May 7 Life and Death in a Stream: Fish,
Insects, Plants & Pollution (Dr. Lars
Hedin) — Walk
May 21 How Do We Know What Our Environ-
ment Brings Us? ... A Walk Through the
IES Environmental Monitoring Station
(Kathleen Weathers) — Walk

For ecology walks, dress according to the weather with long pants, socks and sturdy, waterproof footwear. Talks are slide presentations held indoors. In case of inclement weather, call (914) 677-5358 after 1 p.m. to learn the status of the day's program.

GREENHOUSE

The IES Greenhouse is a year-round tropical plant paradise as well as a site for controlled-environment research. The public is invited to explore both aspects during Arboretum hours. There is no admission fee, but visitors should first stop at the Gifford House for a free permit. (See article on page 2 of this Newsletter.)

ARBORETUM HOURS (October 1 - April 30):

The **Arboretum** is open Monday through Saturday, 9 a.m. to 4 p.m.; Sunday 1 - 4 p.m.

The **Gift and Plant Shop** is open Tuesday through Saturday 11 a.m. to 4 p.m. and Sunday 1 - 4 p.m. (closed weekdays from 1 - 1:30 p.m.).

The Arboretum and Shop are closed on public holidays. Roadways and trails are closed when snow-covered.

All visitors must obtain a free permit at the Gifford House for access to the Arboretum. Permits are available up to one hour before closing time.

MEMBERSHIP

Become a member of the Mary Flagler Cary Arboretum. Benefits include a special member's rate for IES courses and excursions, a 10% discount on purchases from the Gift Shop, free subscriptions to the IES Newsletter and Garden (the beautifully illustrated magazine for the enterprising and inquisitive gardener), and parking privileges and free admission to the Enid A. Haupt Conservatory at The New York Botanical Garden in the Bronx. Individual membership is \$25; family membership is \$35. For information on memberships, contact Janice Claiborne at (914) 677-5343.

For more information, call (914) 677-5358 weekdays from 8:30 - 4:30

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